

Inelastic X-ray Scattering as a Probe of Condensed-Matter: Basic Principles and Applications

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Inelastic x-ray scattering is rapidly developing as a powerful new probe of condensed matter systems. Fundamental principles of inelastic x-ray scattering will be introduced in the first of this lecture series. Applications of IXS to study strongly correlated electron systems and magnetic materials will be discussed subsequently.

First lecture: Inelastic processes will be discussed from fundamental electron-photon interaction hamiltonian. Three scattering regimes will be considered based on q (wavevector) times l (the char. length scale) : (1) $q.l$ much smaller than unity : long wave-length collective regime (phonons, plasmons etc.) (2) $q.l$ on the order of unity : Brillouin zone regime (bandstructure effects) (3) $q.l$ much larger than 1 (unity) : high-energy Compton regime (single particle properties).

Subsequent lectures will be delivered on topics such as phonon dispersions, electron-phonon interactions, plasmons in correlated systems, bandstructure, resonant inelastic processes and soft x-ray (L- and M-edges) resonant inelastic scattering with focus on in strongly correlated electron systems.